4. Nationaler Weltraumwetterworkshop

Beiträge des DLR zur satellitengestützten Datengewinnung im Sonne-Erde-System

K.-D. Missling et al.

Deutsches Zentrum für Luft- und Raumfahrt(DLR)

11.bis 13. Mai 2015, DLR Neustrelitz

DLR-Standort Neustrelitz

Standort des DLR mit ca. 70 Mitarbeitern

Technologiemarketing

DLR_Campus Neustrelitz

Institute und Einrichtungen:

- Institut für Kommunikation und Navigation (IKN)
- Institut für Methodik der Fernerkundung
- Deutsches Fernerkundungsdatenzentrum (DFD)

Foto: Jens Pollex, DLR

DLR-Standort Neustrelitz

DFD

- Permanente Empfangsstation für Fernerkundungs- und wissenschaftliche Kleinsatelliten
- Entwicklung und Betrieb von Missions-PACs incl. NRT - Verarbeitung und Datenauslieferung

IKN

- Verfahren zum NRT Monitoring des Ionosphärenzustandes
- Untersuchung ionosphärischer Störungen
- Ionosphärische Korrekturen
- Bewertung des Zustandes der Ionosphäre
- Entwicklung von Korrektur- und Vorhersagemodellen

DLR-Standort Neustrelitz

DFD

IKN

IMPC

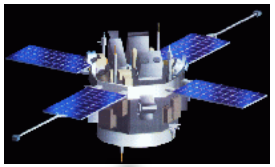
MOC/ SDS

Internet

Weitere Datenquellen

Nutzer

Advanced Composition Explorer (ACE)

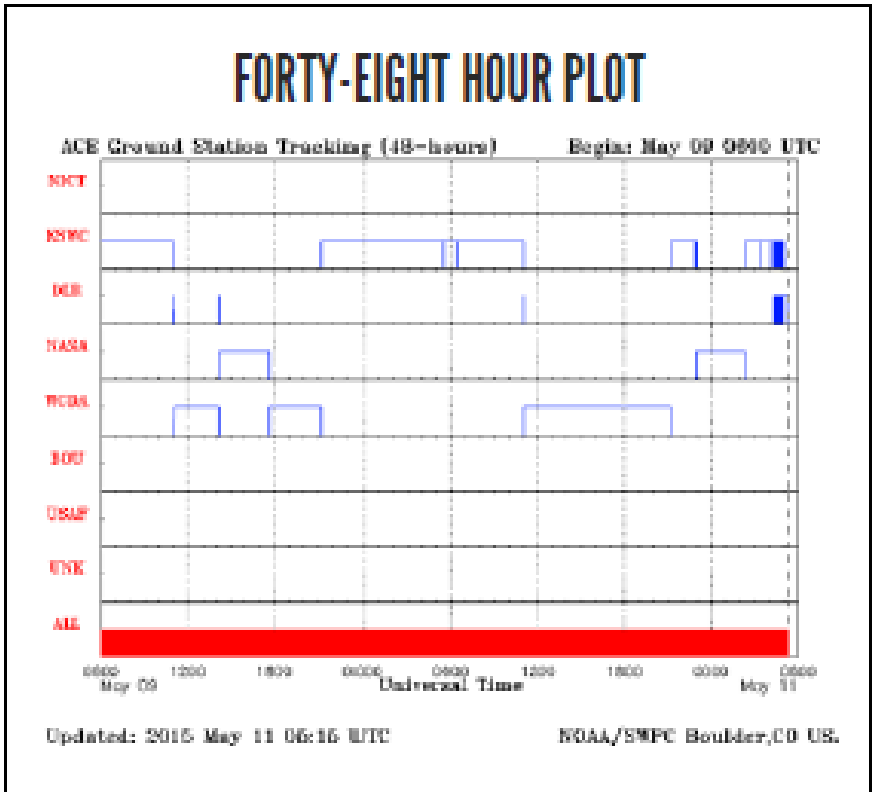


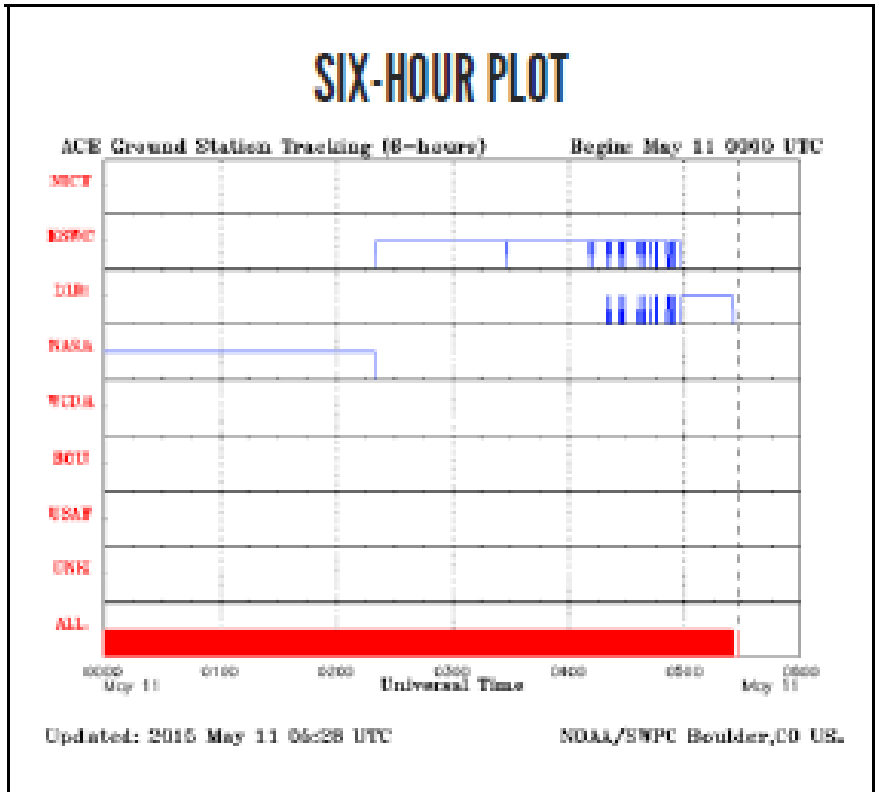
- Start 1997 (nominelle Lebensdauer 5 Jahre)
- L1 Orbit
- Instrumente:
  - Cosmic Ray Isotope Spectrometer (CRIS)
  - Solar Isotope Spectrometer (SIS)
  - Ultra Low Energy Isotope Spectrometer (ULEIS)
  - Solar Energetic Particle Ionic Charge Analyzer (SEPICA) (2008 ausgefallen)
  - Solar Wind Ion Mass Spectrometer (SWIMS)
  - Solar Wind Ion Composition Spectrometer (SWICS)
  - Electron, Proton, and Alpha-particle Monitor (EPAM)
  - Solar Wind Electron, Proton and Alpha Monitor (SWEPAM)
  - Magnetometer (MAG)
  - Real Time Solar Wind (RTSW)
- Browse (1-minute, 5-minute averaged RT data, 1-hour averaged RT data),
- RT SOLAR WIND DATA
- Level 2… Produkte von Wissenschaftsteams
- Privilegierter Zugriff
  - B_z z-Komponente des interplanetaren Magnetfeldes,
  - n_p proton density
  - v solar wind speed
  - P dynamical pressure.

NOAA/
SWPC

Advanced Composition Explorer (ACE) – Station Network

The RTSWnet : NICT, KSWC, DLR, NASA, NOAA(2) ,USAF



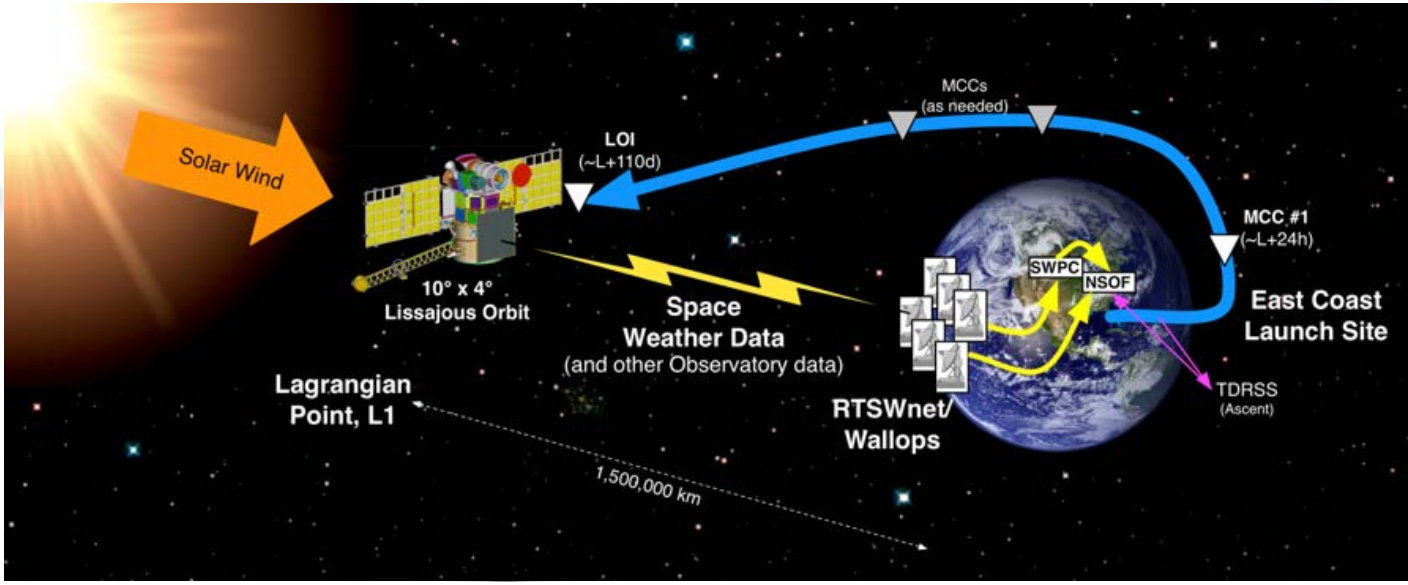


Quelle: http://www.swpc.noaa.gov/products/ace-ground-station-tracking-plots, 11.05.2015

Deep Space Climate Observatory (DSCOVR)

- Start 11. Februar 2015
- L1 Orbit
- bis Zielorbit (1.5 Mill. Kilometer, ~110 Tage)
- Instrumente:
  - Solar Wind Plasma Sensor and Magnetometer (PlasMag)
  - National Institute of Standards and Technology Advanced Radiometer (NISTAR)
  - Earth Polychromatic Imaging Camera (EPIC)
  - Electron Spectrometer (ES)
  - Pulse Height Analyzer (PHA)
- seit 28.4.2015 paralleler Empfang ACE-DSCOVR

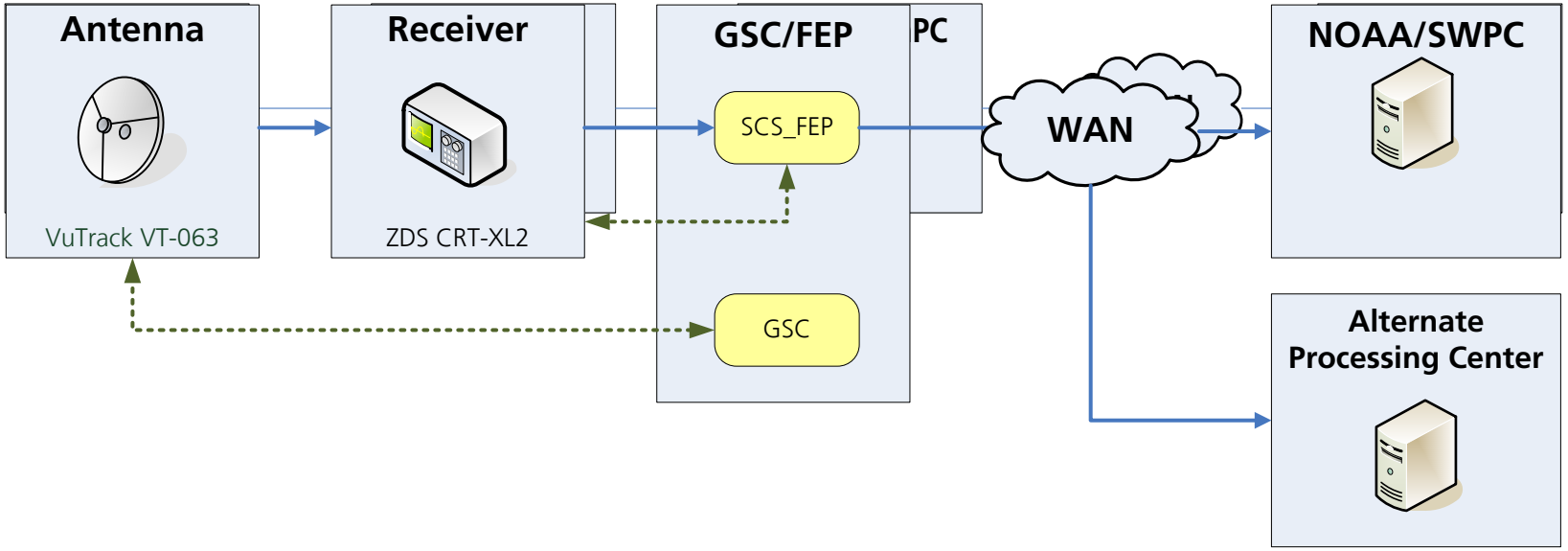
NOAA/
SWPC



Empfang DSCOVR – ACE

	DSCOVR	ACE
Frequency	2215 MHZ	2278,35 MHz
Polarization	LHCP	RHCP
Modulation	Bi-Phase PM, Index 1.2 radians	Bi-Phase-L, PM, Index 1.2 radians
Symbol Encoding	Convolutionally coded 1/2, k = 7	Convolutionally coded 1/2, k = 7
Symbol Rate	40.0 kbps	996 bps
Data Rate	20.0 kbps	498 bps
Effective Data Rate	17.4051 kbps (after allowing for the subtraction of the Reed Solomon ERC block and the ASM)	434 bps (after allowing for the subtraction of the Reed Solomon ERC block)
	0,5056 sec/Frame	16 sec/Frame
	1,97785 Frames/sec	0,0625 Frames/sec
ASM (Frame Sync Marker)	Hex 1ACFFC1D	Hex 1ACFFC1D
Frame length	10112 bit	7968 bit
	1264 bytes including the 4 byte ASM, Transfer Frame 1100 bytes, and Reed Solomon code block 160 bytes	996 bytes including the 4 byte ASM, Transfer Frame 864 bytes, and Reed Solomon code block 128 bytes
Randomization	CCSDS Pseudo Randomization applied to Transfer Frame plus the RS Block	CCSDS Pseudo Randomization applied to Transfer Frame plus the RS Block
RS Coding	Reed Solomon error correction Block (255,223) with interleave I=5 per the CCSDS specification	Reed Solomon error correction Block (255,223) with interleave I=4 per the CCSDS specification

Empfang DSCOVR – ACE (2)



GSC	Ground Station Controller
FEP	Front-EndProcessor
SWPC	Space Weather Prediction Center (Boulder, USA)

Data Flow

Control Flow

Empfang DSCOVR – ACE: aktueller Status

Von: Doug Biesecker [mailto:doug.biesecker@noaa.gov]
Gesendet: Donnerstag, 30. April 2015 21:35
An: Richter, Jens
Betreff: Re: Great data from DSCOVR

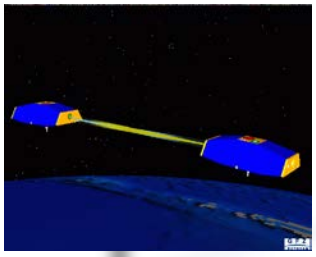
The data have been good. Seems to be some issues with the data quality right around AOS and LOS. That's not too big a surprise. Wondering if you've noted the same thing.

DSCOVR arrives at L1 on June 8. The 5 hour insertion burn starts June 7 and finishes on the next day. There is at least another 30 days of checkout before the reviews for handover from NASA to NOAA. So, we don't expect to switch operationally until at least July 15.

This does bring up the question of what your plans are for the 4m dish. There's some talk of tracking both ACE and DSCOVR in parallel. I had assumed you didn't have the resources to do this, but if the 4m is available, maybe it can be used?

Doug

GRACE

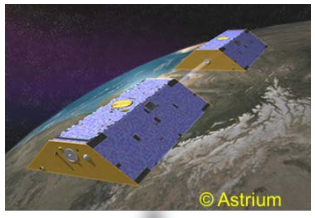


GRACE SDS (JPL, GFZ)

- Start 2002 (Nominelle Lebensdauer 5 Jahre)
- LEO (~450 km)
- Instrumente
  - K-Band Ranging System (KBR)
  - Accelerometer (ACC)
  - GPS Space Receiver (GPS)
  - Laser Retro-Reflector (LRR)
  - Star Camera Assembly (SCA)
- Rohdatenzentrum der Mission, u.a. Langzeitarchivierung:
  - GRACE1.ALL.RAW 57327
  - GRACE2.ALL.RAW 48124
- vom GFZ (rinex): gnss raw data
  → TEC
  → electron density profiles

GRACE Mission Operation Review 5.5.2015:
Ressourcen reichen noch für ~3 Jahre

GRACE-FO



- geplanter Start 2017
- LEO (~450 km)
- Instrumente
  - K-Band Ranging System (KBR)
  - Accelerometer (ACC)
  - GNSS Receiver Assembly
  - Laser Retro-Reflector (LRR)
  - **Laser Ranging Interferometer (LRI)**

GRACE SDS (JPL, GFZ)

Zusammenfassung

- Rohdatenzentrum der GRACE Mission
- seit 2009 Teil des Real Time Solar Wind (RTSW) Netzwerks zum Empfang des Satellite Advanced Composition Explorer (ACE)
- Seit 2012 wurde ein dediziertes Antennensystem in Betrieb genommen und 2014 für den DSCOVR-Empfang aufgerüstet
- Seit April 2015 paralleler Empfang ACE und DSCOVR (noch in Phase der Annäherung des Zielorbits)